

**Operations Research Department
Naval Postgraduate School
Monterey, CA 93943**



**United States Army Chief of Staff
Annual Award for
Excellence in Operations Research
Thesis Presentations**



2 June 1999

1500-1700, Glasgow 102

MARIE LOUISE HALL, CPT, USA

A Scheduling Model for Army Initial Entry Training Courses

Advisor: LTC David Olwell

Second Reader: LTC(P) Michael McGinnis

Scheduling U.S. Army Initial Entry Training classes week by week over a one year planning horizon is a complicated task currently done by hand at the Training and Doctrine Command Headquarters, Fort Monroe, Virginia. Scheduling results are then entered into the Army's automated training system used by both training centers and recruiters to assign enlistees training spaces at training centers. The thesis develops a mixed integer program to plan weekly Basic Combat Training, One Station Unit Training, and Advanced Individual Training course schedules. The goals are to maximize the efficiency of the schedule by minimizing the number of recruits held over, minimize the annual soldier training requirements not met and aspire to optimally fill courses. The model is programmed in the GAMS language. The output is a matrix of courses to assigned start weeks for 230 courses across a 50 week planning horizon.



KEITH HATTES, CPT USA

*Special Operations Mission Planning
and Analysis Support System*

Advisor: Professor Gordon H. Bradley

Second Reader: Assistant Professor Arnold H. Buss

Current mission preparation and analysis methods place an undue burden of effort on conventional and special operations forces to effectively synchronize and execute their increasingly complex operational responsibilities in a rapidly changing global environment. This thesis developed a tool for the United States Special Operations Command (USSOCOM) in support of their Mission Planning, Analysis, Rehearsal, and Execution (MPARE) initiative to allow special operations forces commanders and staffs to conduct mission planning and analysis in a distributed environment, and rapidly produce dynamic synchronization matrices and scheduling products. Operations research methods provide the foundation for the system developed in this thesis called the Special Operations Mission Planning and Analysis Support System (SOMPASS). SOMPASS is simple to learn and operate, provides dynamic changes with little effort, and is universal in application. This system has the capability to execute on any hardware platform, operate across any network connection and expand easily to support additional users and requirements. This thesis provides not only a demonstration of capabilities through a special operations oriented illustrative scenario, but also a working product that can be adapted for general use in mission planning and analysis by all Army units.

GARRET D. HEATH, CPT, USA

Simulation Analysis of Unmanned Aerial Vehicles (UAVs) and Sensor-Shooter Links

Advisor: LTC Charles Shaw III

Second Reader: Assistant Professor Arnold H. Buss

With the signing of the Mission Need Statement (MNS) for Close Range Reconnaissance, Surveillance and Target Acquisition (RSTA), warfighting Commanders in Chief (CINCs) have identified a need to provide lower-level tactical units with real-time responsive RSTA. On 25 February 1999, the Military Intelligence Center UAV Operations Office submitted the ORD for the "Brigade Commander's UAV." This document outlines MOPs for a UAV that will fulfill the MNS. Still, there are many unanswered questions, some of which are: "Which UAV system best suits the needs of the brigade commander?", "How many UAVs does a brigade need?", "What are the TTPs for the use of this new system?" Approximate answers to these questions can be obtained through models developed in the Simulation Based Acquisition (SBA) and STEP. This thesis demonstrates the ability to design a small high resolution simulation which can be used to answer these types of questions and also allow for reuse throughout the acquisition process and potentially beyond.



DALE L. HENDERSON, CPT, USA

Modular Terrain Representation in Entity Level Simulations

Advisor: Assistant Professor Arnold H. Buss

Second Reader: MAJ Leroy Jackson

This thesis develops and nominates a standard Application Programmer's Interface for modular terrain representation in entity level simulation. The goals for the standard modular terrain interface are to provide simulation composability, support improved simulation interoperability, reduce simulation development costs, support other modeling and simulation standards, provide flexibility for simulation developers, allow for high performance implementation, and foster innovation in future simulations.

OPERATIONS RESEARCH AT THE NAVAL POSTGRADUATE SCHOOL

Operations research is the development and application of mathematical models, statistical analyses, simulations, analytical reasoning and common sense to the understanding and improvement of real-world operations. Improvement can be measured by the minimization of cost, maximization of efficiency, or optimization of other relevant measures of effectiveness. Operations researchers are called upon frequently to advise military and civilian decision makers on the allocation of scarce resources, the selection of new equipment and processes, and the optimal deployment of given resources to achieve required missions.

The Naval Postgraduate School's Operations Research Department offers M.S. and Ph.D. degrees. It is one of the oldest, largest, and highest ranking OR departments in the US. It is without peer in terms of the extent to which graduate education is integrated with a commitment to solving real military problems. Operations research is suggested as a discipline of study for those students who enjoy using mathematical ideas and computers to penetrate deeply into the analysis of important real-world problems. *Analysis* is a key word; NPS operations researchers use modeling, simulation and computing to influence decisions, and to serve as an agent for change.

Faculty and students of the Operations Research Department frequently perform research for the Department of Defense as part of the educational program and under formal research agreements. The Army Chief of Staff Thesis Award Presentation is but one of the many research-oriented activities conducted in the NPS OR Department. The department's home page on the World Wide Web provides up-to-date information on research products and seminars.

Richard E. Rosenthal, Chairman
Alan R. Washburn, Associate Chairman for Instruction
Gerald G. Brown, Associate Chairman for Research
CDR Ronald L. Brown, USN, Associate Chairman for Operations
Operations Research Department
Naval Postgraduate School
Monterey, CA 93943
(831) 656-2381 (DSN: 878)
<http://web.nps.navy.mil/~opnsrsch/>